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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,882	07/31/2003	Praburam Gopalraja	6775	3048

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EXAMINER

VERSTEEG, STEVEN H

ART UNIT

PAPER NUMBER

1753

DATE MAILED: 04/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/632,882

Applicant(s)

GOPALRAJA ET AL.

Examiner

Steven H. VerSteeg

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-45 is/are allowed.
- 6) ☒ Claim(s) 46-50 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/29/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: **210** [0048]; **252** [0054]; **253** [0054]; **318** [0060]; and **334** [0062]. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: **256**, **260**, **264**, **262**, **294**, and **296** (see Figure 7); and **304** and **151** (see Figure 4). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet"

Art Unit: 1753

pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities: please insert the patent number for the application listed at [0015]; and “that that” needs corrected at [0022], line 6.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 46-50 are rejected under 35 U.S.C. 102(e) as being anticipated by US 2003/0217914 A1 to Miller et al. (Miller)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention “by another,” or by an appropriate showing under 37 CFR 1.131.

Art Unit: 1753

6. For claim 46, Applicant requires a reactor system for depositing conductive material onto a substrate comprising target means for sputter depositing a layer of conductive material onto the substrate and for generating a self ionized plasma to ionize a portion of the conductive material sputtered from the target means prior to being deposited onto the substrate; capacitively coupled plasma means including a pedestal electrode for generating a capacitively coupled plasma and for biasing a substrate to attract plasma ions to resputter a portion of the conductive material from the substrate; and electromagnetic coil means for generating a magnetic field to surround the pedestal and confine the plasma to increase the density of the plasma adjacent the pedestal electrode.

7. Miller discloses an apparatus for sputtering (Figure 22) comprising target means for sputter depositing and generating a self-ionized plasma [0078]; capacitively coupled plasma means including an RF biased pedestal [0078] and electromagnetic coil means 258 for generating a magnetic field to surround the pedestal and increase the density of the plasma adjacent the pedestal electrode.

8. For claim 47, Applicant requires the target means to include a target comprising a conductive material to be sputtered on the substrate and a magnetron adjacent the target and having an area of no more than about $\frac{1}{4}$ the area of the target and including an inner magnetic pole of one polarity surrounded by an outer pole of opposite polarity with the outer pole flux being at least 50% larger than the inner pole flux. Miller discloses rotating a magnetron about the back of the target with the magnetron having an area of no more than 10% of the target [0085] where the outer pole is at least 1.5 times the flux of the inner pole [0086].

Art Unit: 1753

9. For claim 48, Applicant requires the capacitively coupled plasma means to include RF generator means to apply RF energy to the pedestal. Miller applied RF energy to the pedestal [0078].

10. For claim 49, Applicant requires the target to be spaced from the substrate by a distance of at least 50% the diameter of the substrate. Miller discloses providing a chamber with the target 400 mm from a 300 mm wafer [0096].

11. For claim 50, Applicant requires controller means for inhibiting sputtering by the target while the target material is resputtered from the substrate by the capacitively coupled plasma means. Control means 136 are present that control the resputtering [0078].

12. Claims 46, 48, and 50 rejected under 35 U.S.C. 102(e) as being anticipated by US 2004/0020770 A1 to Wang et al. (Wang)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

13. Claims 46, 48, and 50 are described above. Wang discloses a magnetron sputter reactor (abstract) comprising target means for sputter depositing a conductive layer onto a substrate and for creating a self ionized plasma [0029]; capacitively coupled plasma means including an RF bias on the pedestal [0029]; and electromagnetic coil means 130 the generate a magnetic field to surround the pedestal. Control means inhibit sputtering by the target during resputtering [0029].

Allowable Subject Matter

14. Claims 1-45 are allowed.

15. The following is an examiner's statement of reasons for allowance: it is neither anticipated nor obvious over the prior art of record to have a method of sputter depositing deposition material onto a substrate supported by a pedestal in a chamber as claimed by Applicant in claim 1; it is also neither anticipated nor obvious over the prior art of record to have a method of sputter depositing a layer of metal material into a plurality of holes on a substrate as claimed by Applicant in claim 24; and it is also neither anticipated nor obvious over the prior art of record to have a plasma sputter reactor system for sputter depositing a film on a substrate as claimed by Applicant in claim 25.

16. JP 63-18071 (JP '071) discloses a sputtering method and apparatus comprising RF biasing the substrate and applying a magnetic field near the substrate using an excitation coil. Another excitation coil is placed behind the target. There is no indication that the excitation coil rotates or is $\frac{1}{4}$ the area of the target or that the electromagnet could be a magnetron with an outer pole of 50% greater flux than the inner pole. There is no indication that the plasma is a self-ionized plasma. There is no indication that the generated magnetic field would surround the pedestal.

17. US 4,871,433 to Wagner et al. (Wagner) discloses a magnetron sputtering system and method wherein a magnetic field is formed that surrounds the pedestal (Figure 3). The substrate is biased as well. The magnet behind the target, however, is not $\frac{1}{4}$ the size of the target and there is no outer pole that is at least 50% larger in flux than the inner pole. There is no indication that the target means generate a self-ionized plasma.

Art Unit: 1753

18. US 2003/0217914 A1 to Miller et al. (Miller) is assigned to the same assignee as the instant invention. Figure 22 shows an apparatus with an electromagnet behind the substrate with a rotating magnetron behind the target. The substrate is RF biased. The electromagnetic coil is disposed below the substrate, not around the periphery. There is no indication that the DC power to the target is reduced after depositing a layer into the holes of the substrate and the DC power disclosed is lower by a factor of 10 which would render 10kW power to the target unobvious. The shield does not carry the electromagnets.

19. US 2004/0020770 A1 to Wang et al. (Wang) does not disclose the electromagnetic coil to be around the periphery of the pedestal or the magnetron to be $\frac{1}{4}$ the area of the target.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

General Information

For general status inquiries on applications not having received a first action on the merits, please contact the Technology Center 1700 receptionist at (571) 272-1700.

For inquiries involving Recovery of lost papers & cases, sending out missing papers, resetting shortened statutory periods, or for restarting the shortened statutory period for response, please contact Denis Boyd at (571) 272-0992.

For general inquiries such as fees, hours of operation, and employee location, please contact the Technology Center 1700 receptionist at (571) 272-1300.


Art Unit: 1753

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. VerSteeg whose telephone number is (571) 272-1348. The examiner can normally be reached on Mon - Thurs (6:30 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Steven H VerSteeg
Primary Examiner
Art Unit 1753

shv
April 5, 2005